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AEDES AEGYPTI IN CÓRDOBA PROVINCE, ARGENTINA[1]

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ABSTRACT. In 1955, the area infested by *Aedes aegypti* in Argentina was estimated as 1,500,000 km^2; and in 1963, the species was considered to be eradicated from Argentina. In 1995, the Argentine Ministry of Health reported reinfestation by *Ae. aegypti.* During 1994–95, the Ministry of Health of Córdoba Province, Zoonosis Department, established a surveillance system for *Ae. aegypti* in Córdoba Province, Argentina. This report is a summary of results obtained thus far. In total, 74 localities in Córdoba Province were sampled during August 1994–April 1996, resulting in 5 positives (6.7%): Villa María city, Villa Nueva, and Córdoba city in 1995, and Juarez Celman and Jesús María in 1996. In Villa María and Villa Nueva, *Ae. aegypti* was present until June 1995 (autumm) and reappeared in December 1995. In Córdoba city, *Ae. aegypti* was eliminated from the only positive house in May 1995, but it reappeared in March 1996. Reappearence of *Ae. aegypti* in this temperate area in early summer may have been due to the survival of individuals during winter and not to reintroduction during summertime. The last previous active surveillance for *Ae. aegypti* in Córdoba Province was carried out more than 30 years ago.

INTRODUCTION

Aedes aegypti is the principal urban vector of dengue (DEN) and yellow fever (YF). Originally a tropical species, the range of *Ae. aegypti* extends from somewhat north of the July 10°C isotherm in the Northern Hemisphere to the January 10°C isotherm in the Southern Hemisphere (Christophers 1960). Buenos Aires represents the extreme southern limit of the recorded distribution of the species (Kumm 1931, Ousset et al. 1967).

Both YF and DEN have been recorded in Argentina on several occasions. The last major YF urban epidemic was in Buenos Aires in 1871, with 13,761 deaths and 40,000 estimated cases (Del Ponte 1959). Such epidemics are likely to have resulted from summertime introductions from ships

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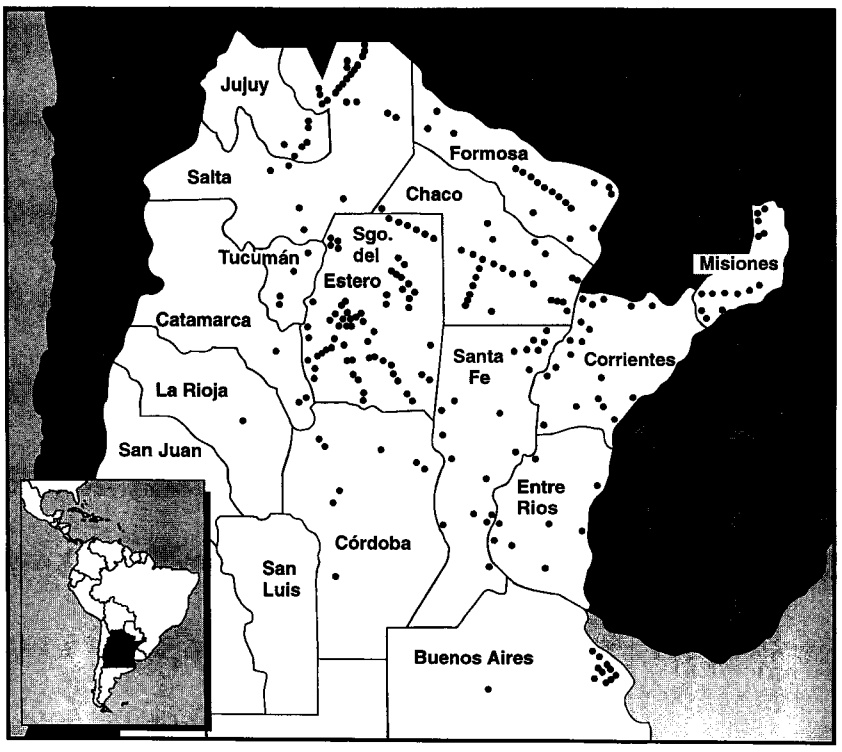

Fig 1. Geographic distribution of *Aedes aegypti* in Argentina up to 1963.

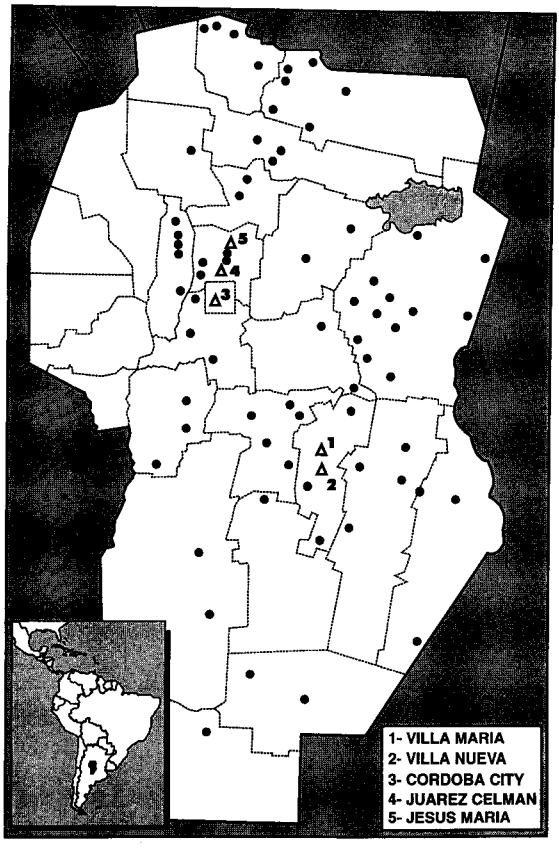

Fig 2. Localities sampled in Córdoba Province during *Aedes aegypti* surveillance.

arriving from tropical ports, as occurred frequently during the same period in many cities in the Northern Hemisphere (Strode 1951). However, further north, endemic transmission can occur. Thus, in 1966, an epidemic of jungle YF occurred in Misiones and Corrientes provinces, with 76 notified cases (Sabattini et al. 1997). This is the only time that YF virus has been isolated in Argentina (Barrera Oro et al. 1966).

Dengue cases were reported in 1905 and 1911 in Chaco, Corrientes, and Misiones provinces, and, in 1916, a major DEN epidemic occurred along both margins of the Uruguay River, including several localities in Entre Rios Province (Gaudino 1916, Sa-Fleitas and Actis 1959). The number of sick persons was calculated to be 15,000. Since 1916, DEN has not been recognized in Argentina, despite the presence of *Ae. aegypti* during the following 47 years (Sabattini et al. 1997). In 1955, during the continental *Ae. aegypti* eradication campaign, the area infested with *Ae. aegypti* in Argentina was estimated as 1,500,000 km^2 (Fig. 1); later, in 1963, *Ae. aegypti* was considered to be eradicated from Argentina (Bejarano 1968).

The wide latitudinal extension of Argentina leads to a varied climate. The distribution of *Ae. aegypti* extended from the subtropical north to the temperate zone up to 35°S (Ousset et al. 1967, Carcavallo and Martínez 1968). Recently, the Argentine National Ministry of Health reported the presence of *Ae. aegypti* in Salta, Jujuy, Tucumán, Misiones, and Buenos Aires provinces.[5]

During 1994–95, the Ministry of Health of Córdoba Province, Zoonosis Department, established a surveillance system for *Ae. aegypti* in Córdoba Province, Argentina. The purpose of this report is to summarize the results obtained thus far.

MATERIALS AND METHODS

Córdoba Province is located in the temperate zone of Argentina, between the 29°S and 35°S. Córdoba city has 1,179,067 inhabitants and it has an international airport. Three cities (Villa María, Río Cuarto, and San Franciso) have between 50,000 and 100,000 inhabitants and 18 cities have between 10,000 and 50,000 inhabitants.[6] Also, the province has several small airports.

The sampling was conducted during August 1994–April 1996, with different frequences depending on the locality. Several localities in Córdoba Province were sampled. Initially, some localities were selected because they had been positive until 1963 (Fig. 1), others because they are important communication centers, and others because they are representative of a certain area. After finding the first positive location, surveillance was extended to more localities in the area. Sampling was done at cemeteries, airports, bus stations, gas stations, houses, tire recapping facilities, and waste can deposits. Places such as these that were located on main roads at entrances to the various towns and cities were always sampled because traffic, especially of trucks potentially transporting mosquitoes, is more concentrated in these places. The sampling routine consisted of collection of larvae by using larvitraps (pieces of tires) and by sampling several water receptacles, and aspiration of adults attracted to the collectors. The institutions involved were municipalities and health centers of each locality. Physicians, veterinarians, nurses, or technicians were instructed to place larvitraps at selected sites, to collect and put the larvae in alcohol, and to send them for taxonomic determination to the Zoonosis Department in Córdoba city.

RESULTS AND DISCUSSION

A total of 74 localities were sampled between August 1994 and April 1996, resulting in 5 posi-

[5] January 1995 report to the Provincial Ministries of Health.

[6] Censo de Viviendas, Hogares y Población (1991) Provincia de Córdoba. Ministerio de la Función Pública y de la Reforma Administrativa. Secretaría de Estadísticas, Estudios y Proyectos. Dirección de Estadísticas y Censos.

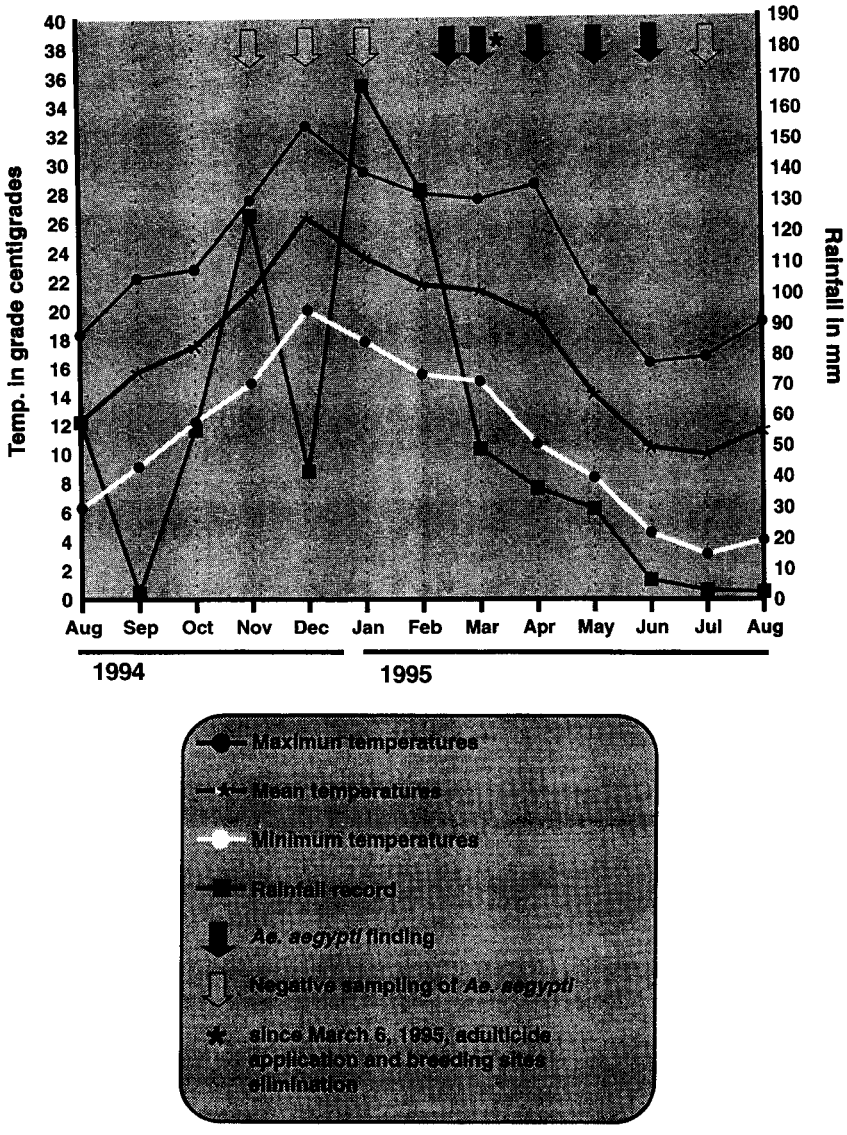

Fig 3. Average monthly temperatures and rainfall registered in Villa María city (August 1994, July 1995).

tives: Villa María city, Villa Nueva, Córdoba city, Juarez Celman, and Jesús María (Fig. 2). Villa María city (Fig. 2) is located at 32°24′S, 63°17′W. This city was sampled monthly during the study period. Just one larvae of *Ae. aegypti* was found on February 13, 1995, in a larvitrap located at the cemetery; 5 other sampling sites were negative. Several *Ae. aegypti* larvae were found at the cemetery on March 6, 1995, and at other sites, especially tire recapping facilities. The number of positive sites was 8/13. It was not possible to determine the Breteau or other indices because of the lack of staff and resources for sampling. Larval and adult densities decreased in March 1995 (autumn). The last positive sample was on June 4, 1995. No larva of any mosquito species was found after July, until *Ae. aegypti* reappeared in December 1995.

The monthly temperature and precipitation means between August 1994 and July 1995, and also the appearance of *Ae. aegypti* in Villa María city, are shown in Fig. 3. During the 4 wk previous to the finding of *Ae. aegypti* (January 15–February 15), a maximum temperature of 35°C (January 1) and a minimum of 10°C (February 2) were registered. During this 30-day period, 15 days had temperatures above 30°C and the remainder had temperatures above 25°C. During those 30 days, 203.1 mm of rain fell. Villa Nueva (Fig. 2), separated from Villa María city only by a bridge, was found to be positive for *Ae. aegypti* on March 11, 1995.

The number of positive sites was 2/4. Villa Nueva became negative in June 1995 and was found to be positive for again in December 1995.

In both localities, municipalities and the Health Center made an effort to eradicate *Ae. aegypti.* Authorities, physicians, and the community in general were informed, and also cleaning and insect control measures were carried out. In spite of these measures, *Ae. aegypti* was present until June (mean temperature = 10.4°C) at those localities.

Córdoba city (Fig. 2) was sampled monthly and found to be positive on May 16, 1995. Larvae and adults were found in the house of a person who had traveled to Villa María city several times and who was working in the *Ae. aegypti* surveillance program. The neighborhood named Villa Cabrera was investigated, looking for larvae in houses and tire recapping facilities, and also sampling was intensified at other sites in the city. No other place was found positive and *Ae. aegypti* was eliminated from the positive house, so the number of positive sites was 1/44 at that time. In March 1996 *Ae. aegypti* was found again in 9 different sites in the following neighborhoods: Villa Cabrera, Guemes, Alta Córdoba, Marqués de Sobremonte, Observatorio, Villa Adela, San Martín, and Ferreyra, and on the road to the airport (km 8). The same place that was positive in 1995 was positive again in 1996 (Villa Cabrera neighborhood). Some of the other positive neighborhoods are almost 10 km from Villa Cabrera.

Juarez Celman and Jesús María were sampled just once. They are located 15 and 50 km north from Córdoba city, respectively, on the same road. They were found to be positive in March 1996.

The rate of positive localities in Córdoba Province was 5/74 (6.7%). Reappearence of *Ae. aegypti* in this temperate area in the early summer (December 1995) may have been due to the survival of individuals during winter at refuges, as suggested by Christophers (1960) for other populations surviving in temperate areas, and not due to reintroduction during summertime. The lack of surveillance during the previous 33 years makes it impossible to establish when Córdoba Province became reinfested. Genetic studies are being done, which could help to clarify this aspect. Important training of health personnel in Córdoba Province and good participation by the community in clean up efforts were attained. Futher surveillance will be required to establish the quantitative infestation by quantitative indices.

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REFERENCES CITED

Barrera Oro, J. G., G. A. Coronado, L. F. Gutman Frugone and A. M. Vilches. 1966. Aislamiento del virus de la Fiebre Amarilla en la Argentina. Etiología de la epidemia de Corrientes y Misiones, 1966. Medicina (B. Aires) 26:239–245.

Bejarano, J. F. R. 1968. Historia de la Fiebre Amarilla Urbana ySelvática en la República Argentina. Rev. Sanid. Mil. Argent. 67(2):211–256.

Carcavallo, R. V. and A. Martínez. 1968. Fiebre Amarilla, Vectores y Cadena Epidemiológica. Comun. Cient. Jta. Invest. Cient. Fuerzas Arm. Arg. Capítulo III 13(2): 105–139.

Christophers, S. R. 1960. *Aedes aegypti* (L), the yellow fever mosquito. Its life history, bionomics, and structure. Cambridge University Press, London, United Kingdom.

Del Ponte, E. F. 1959. Enfoque sanitario de la Fiebre Amarilla para la República Argentina, pp. 217–274. *In*: J. F. R. Bejarano, E. F. Del Ponte and R. Orfila (eds.). Primeras Jornadas Entomoepidemiológicas Argentina. Buenos Aires, Argentina.

Gaudino, N. 1916. El Dengue. Algunas consideraciones sobre la epidemia de Entre Ríos de 1916. Rev. Sanid. Mil. Argent. 15:617–627.

Kumm, H. W. 1931. The geographical distribution of the yellow fever vectors. A compilation of material recorded in the literature, unpublished communications and certain collections made by the author in Nigeria, West Africa. Am. J. Hyg., Monograph Series No. 12.

Ousset, J. H., J. K. De Ustaran and B. Lombardo. 1967. Erradicación del *Aedes aegypti* en la República Argentina (Infestación inicial. Adaptación de procedimientos). Seg Jorn Entomoepidem Arg (Salta) Ed Min salud Publ 2:81–88.

Sabattini, M. S., G. Avilés and T. P. Monath. 1997. Historical, epidemiological and ecological aspects of arboviruses in Argentina: Flaviviridae, Bunyaviridae and Rhabdoviridae. *In:* N. Degallier, P. A. A. Travassos da Rosa, P. F. C. Vasconcelos and J. F. S. Travassos da Rosa (eds.). An overview of arbovirology in Brazil and neighboring countries. Instituto Evandro Chagas, Belem, Para, Brazil (in press).

Sa-Fleitas, J. M. and A. S. Actis. 1959. Algunas enfermedades por virus y rickettsias como problema para la seguridad nacional (Dengue, tifus exantemático, etc.), pp. 421–447. *In:* J. Bejarano, E. Del Ponte and R. Orfila (eds.). Primeras Jornadas Entomoepidemiológicas Argentina. Buenos Aires, Argentina.

Strode, G. K. (editor). 1951. Yellow fever. McGraw-Hill, New York.